

Mercury Total Maximum Daily Load Development for the North Fork Holston River, Virginia

-- Final Public Meeting --

January, 2010

Purpose of This Meeting!

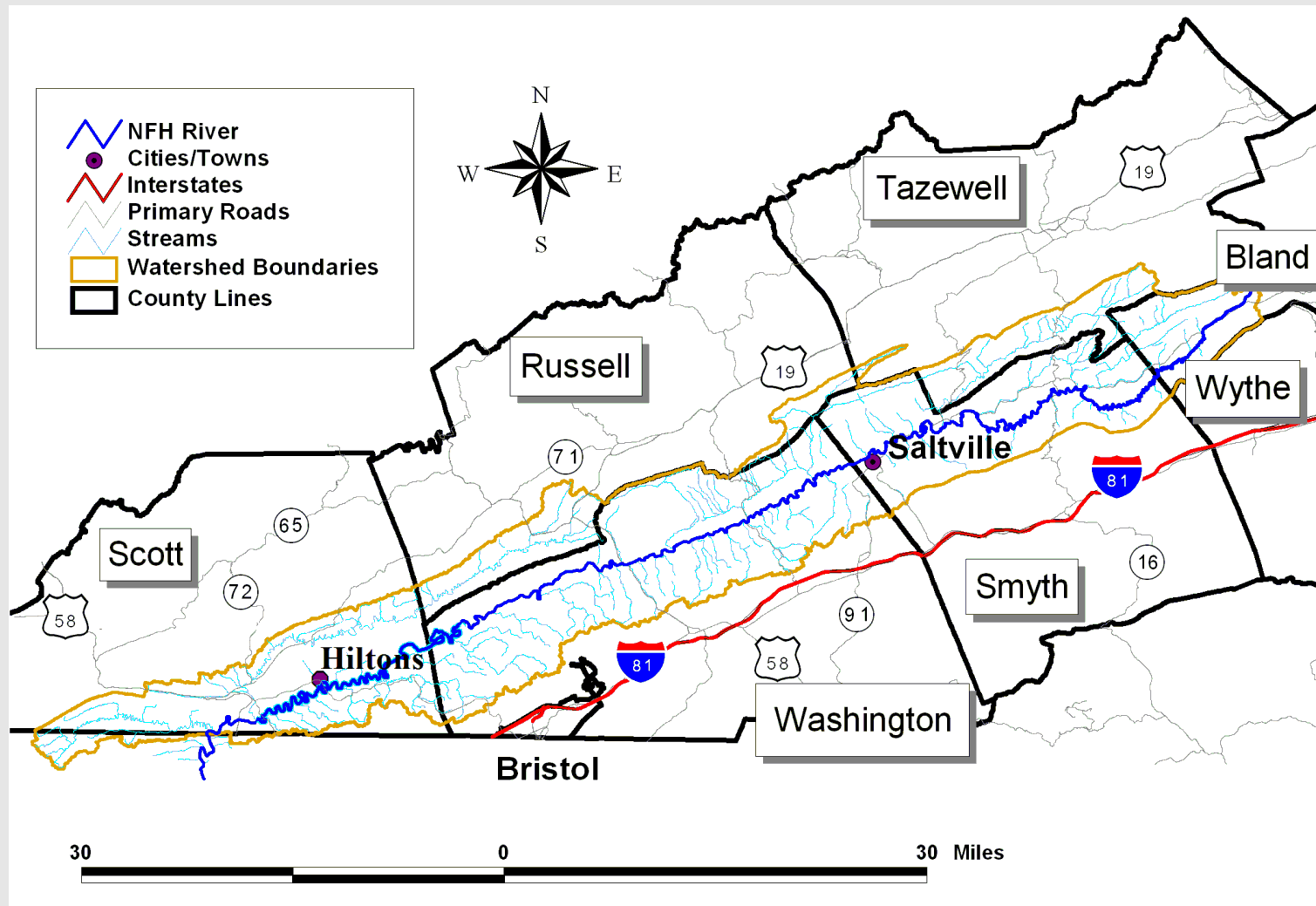
To discuss the mercury TMDL for North Fork Holston River

Total Maximum Daily Load is how much pollutant can enter the stream and have the stream meet the water quality standards

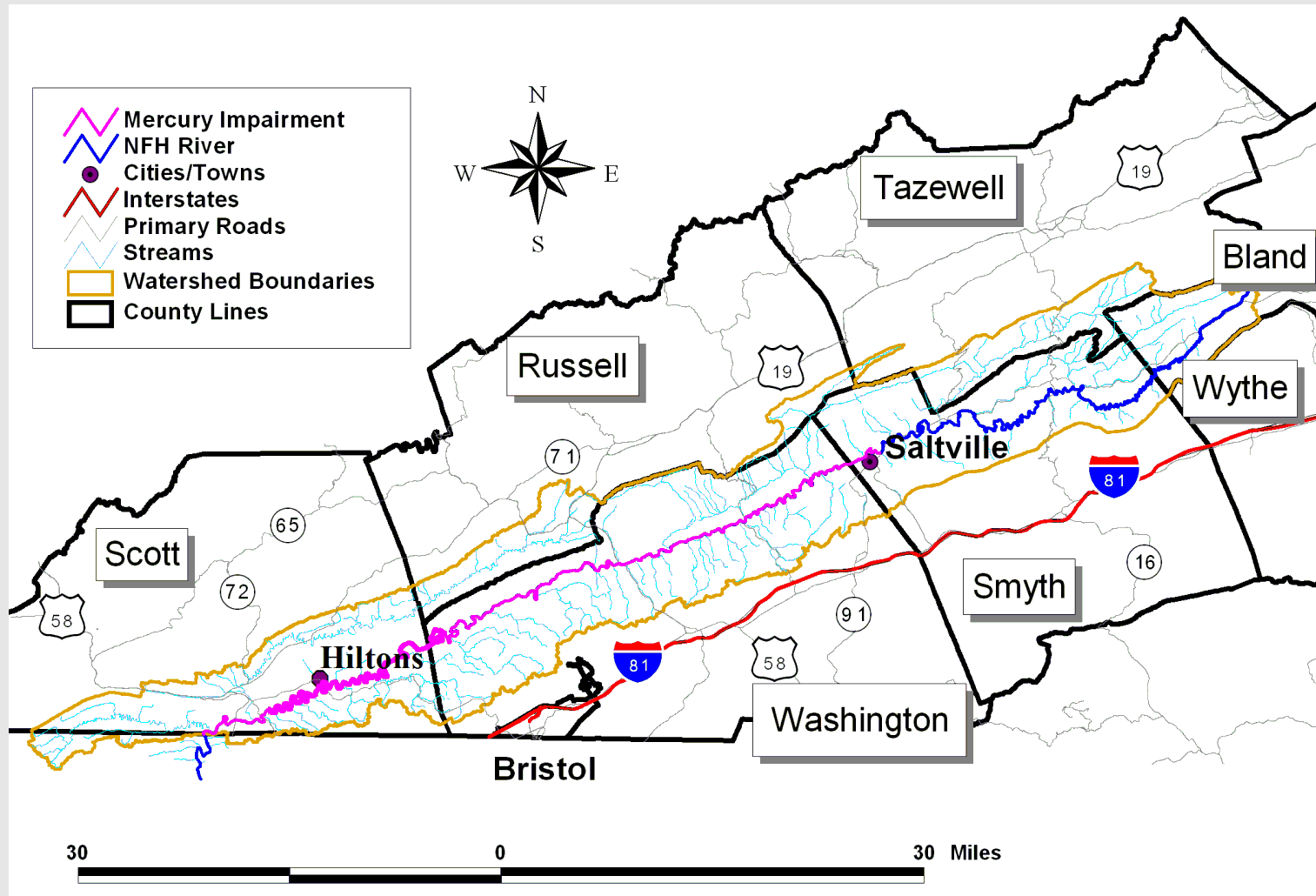
Background

- A mercury TMDL is developed due to concentration of mercury in fish tissue exceeding the fish advisory criterion of 0.3 mg/kg.
- The over exposure to mercury can cause kidney, brain and nerve damage, especially in children.

Location of Study Area



Impairment Location



Sources of Mercury in Study Area

- Atmospheric deposition due to coal burning where exhaust settles back on ground and water surfaces.
 - A portion is deposited directly on the surface of water bodies and the rest on land surfaces where it mixes with soil
- Former Chlorine Plant Site (FCPS) sources.
 - Mercury was discharged to the river from a manufacturing facility that produced chlorine and caustic soda
 - Plant was shut down and demolished in 1972
- Groundwater and interflow
- With runoff during storm events
- Point sources

Source Quantification

Hg Source	Data source	Range of values used
Atmospheric deposition	EPA Mercury atmospheric deposition network	13.6 to 30.4 ng/L
Groundwater from upland areas	Same as concentration observed upstream of contaminated site	1 ng/L
Groundwater within contaminated areas	Between background and middle of atmospheric deposition	1 ng/L to 10 ng/L
Hg attached to sediment with runoff from non-contaminated areas	Background concentration measured with floodplain upstream of site	0.11 mg/kg
Hg attached to sediment with runoff from contaminated areas	Measured concentrations in top 6 inches using MacTech median values	0.12 to 2.3 mg/kg
Point sources	Measured time series	Dissolved fractions provided by MacTech were used and maintained for calibration (0.12,0.22,0.42)

Endpoint Determination

1. Develop a Bioaccumulation Factor (BAF) using fish tissue and water column concentrations where:

$$BAF = \frac{\text{fish tissue concentration}}{\text{ambient Hg concentration in water column}}$$

2. Use BAF and fish advisory criterion to obtain end point in water column:

$$TMDL \text{ water column target} = \frac{\text{fish advisory criterion}}{BAF}$$

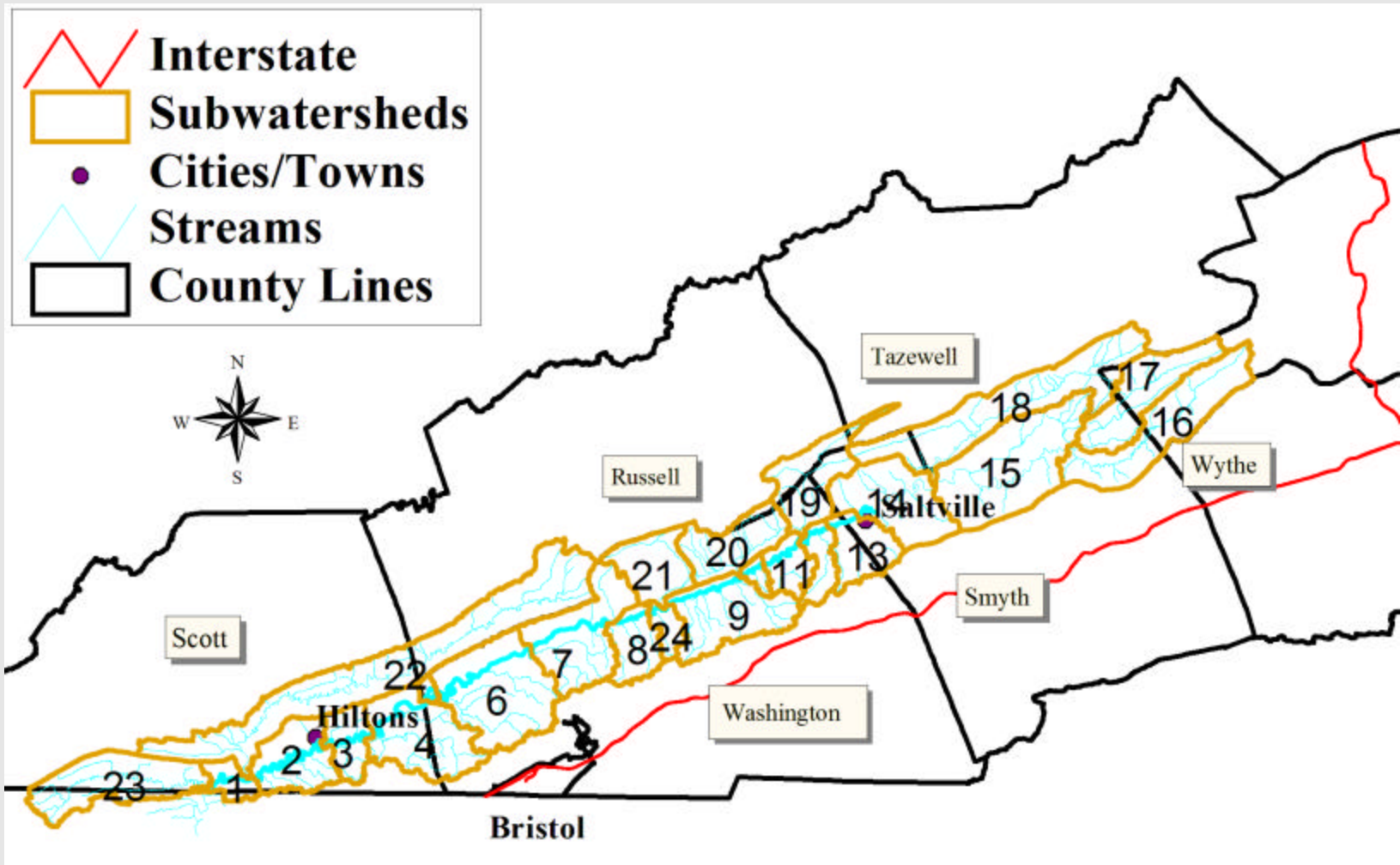
Endpoint Determination

- The median smallmouth bass tissue concentration of 1.4 mg/kg at river mile 60 was used in the BAF calculations.
- The water column concentration used was 7.5 ng/L which was measured as the average concentration between river miles 60.7 and 80.1 during the 2008 sampling.
- Resulting BAF is 186,667 L/kg.
- A site-specific water column endpoint was then be estimated as approximately 2 ng/L.

Computer Modeling Approach

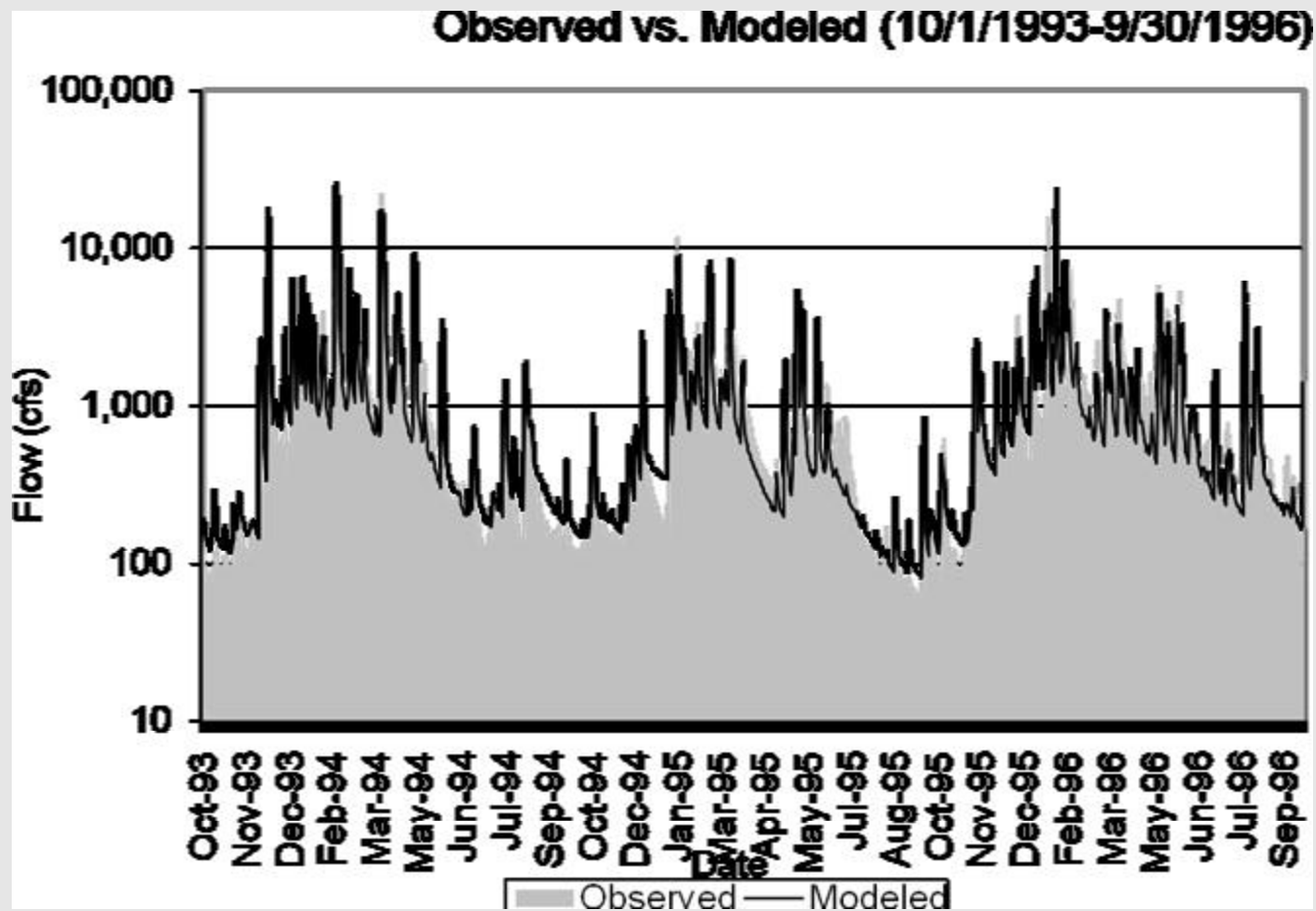
- Area is partitioned into subwatersheds to allow localized parameterization of land use, soil, slopes, soil erosion parameters, and mercury loading parameters
- Model handles overland flow, channel flow, sediment transport, and mercury transport
- Monitored data for flow, sediment, and mercury were used to calibrate the model
- The calibrated model is used to determine existing conditions as well as recommend load reductions to meet endpoint

Subwatersheds



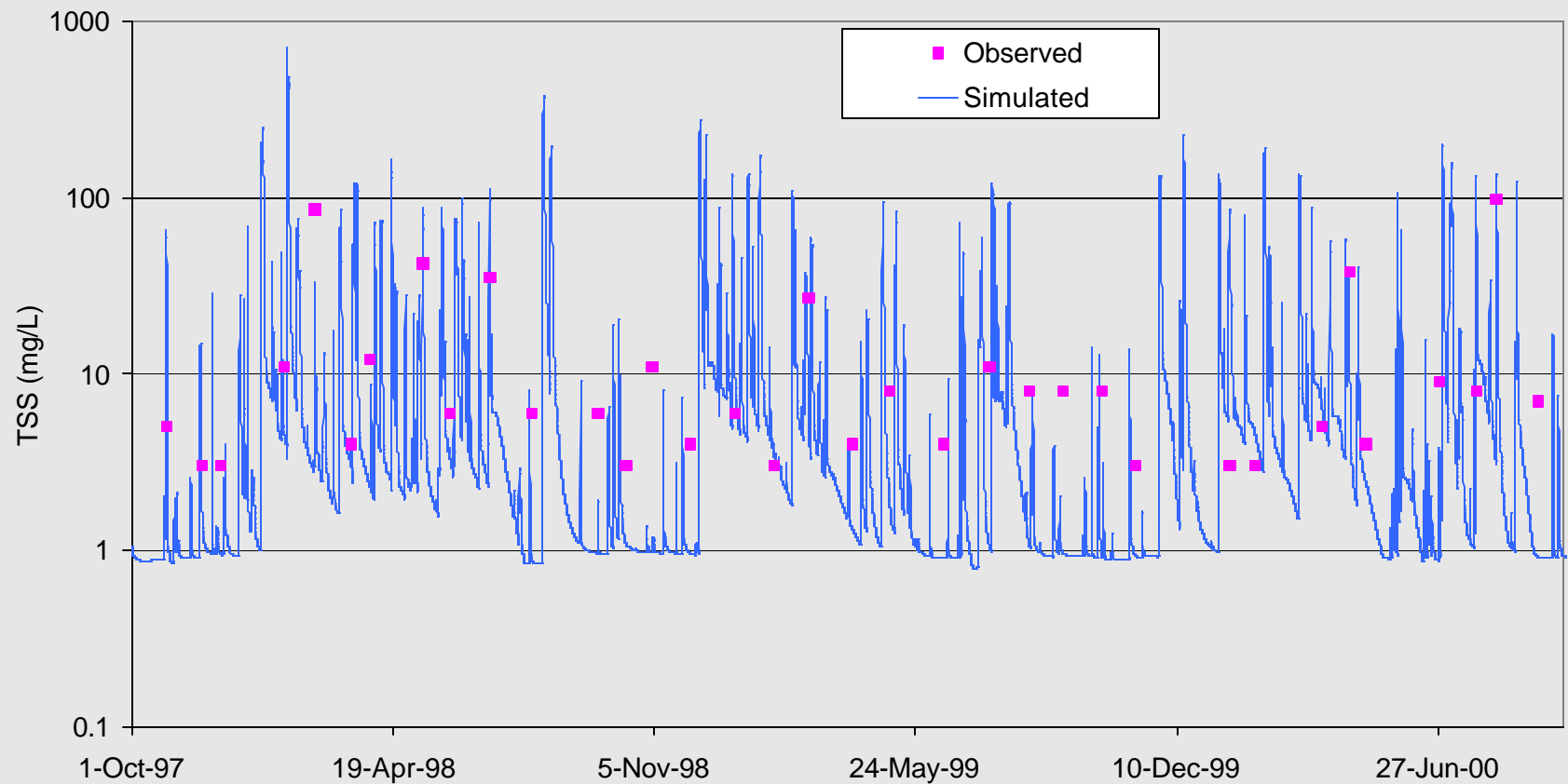
Hydrology Calibration

Hydrology Calibration



Sediment Calibration

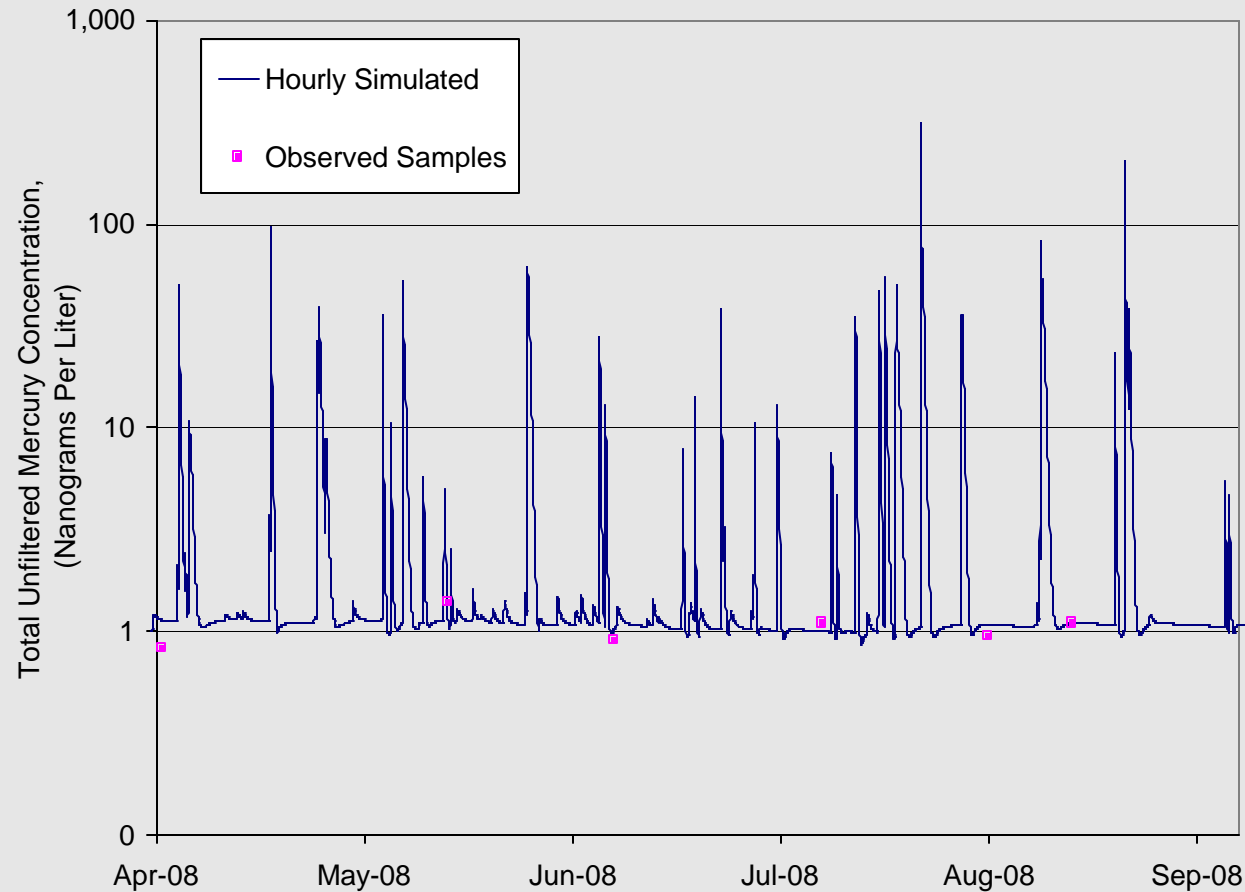
Sediment Calibration (6CNFH008.78)



Mercury Calibration

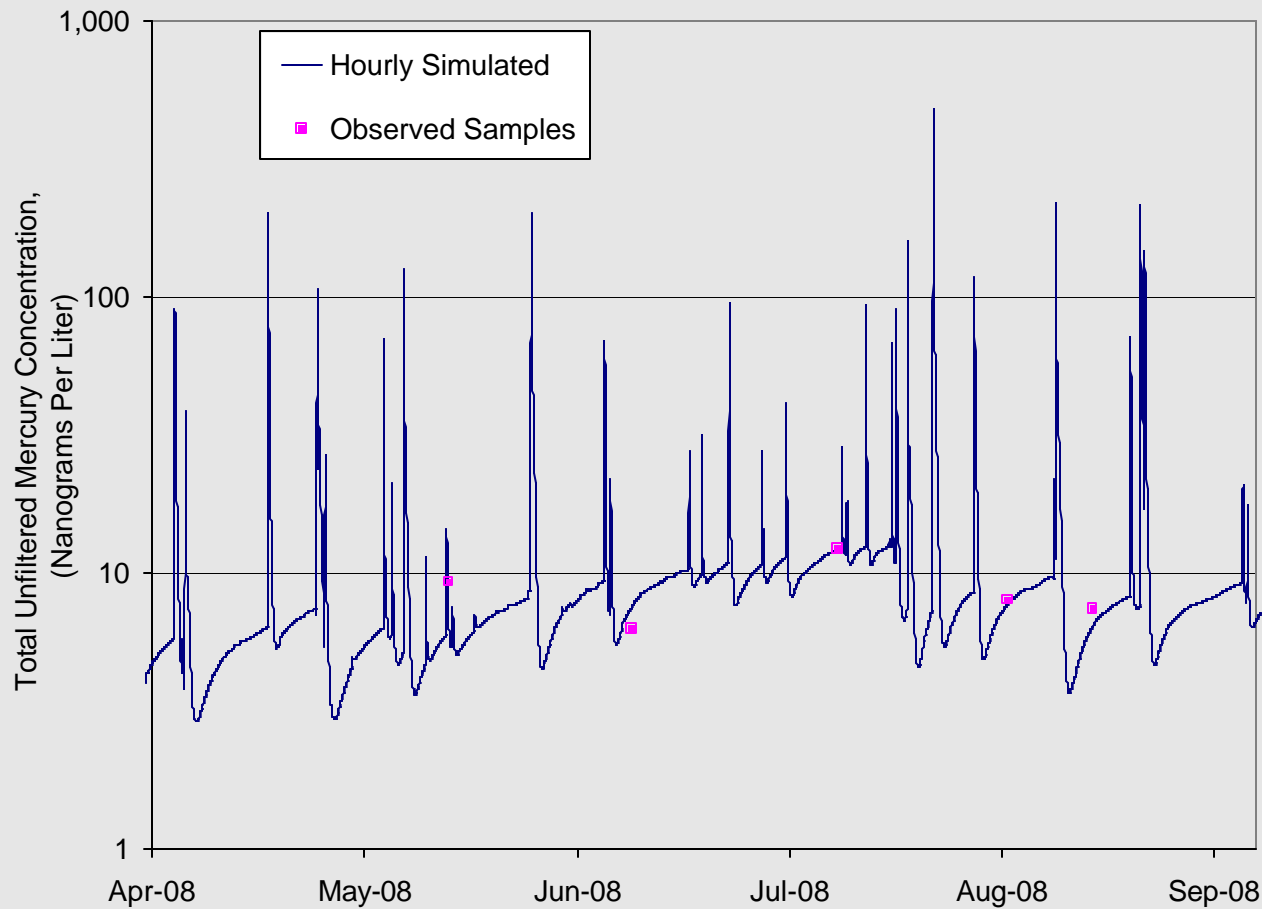
THg Calibration

River Mile 84.3 (background)



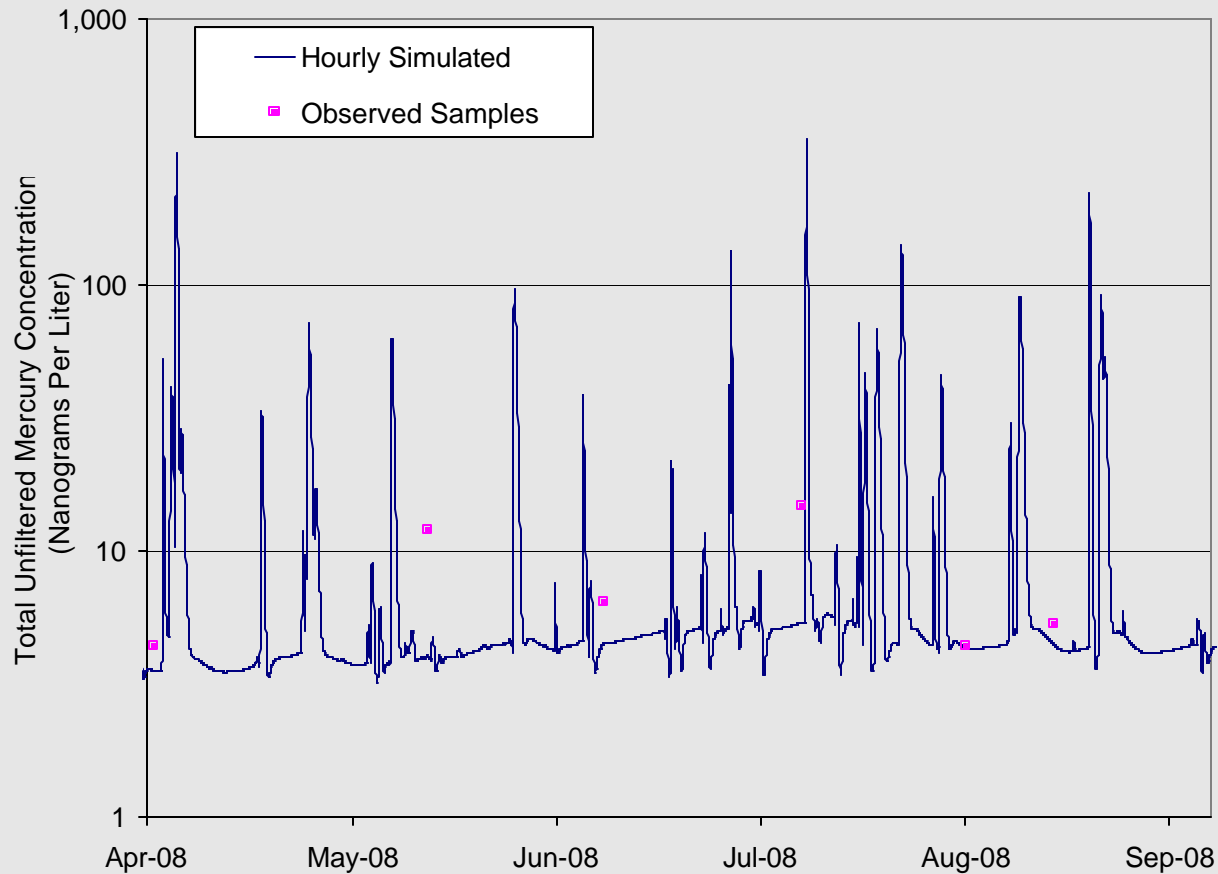
THg Calibration

River Mile 80.1 (below FCPS)

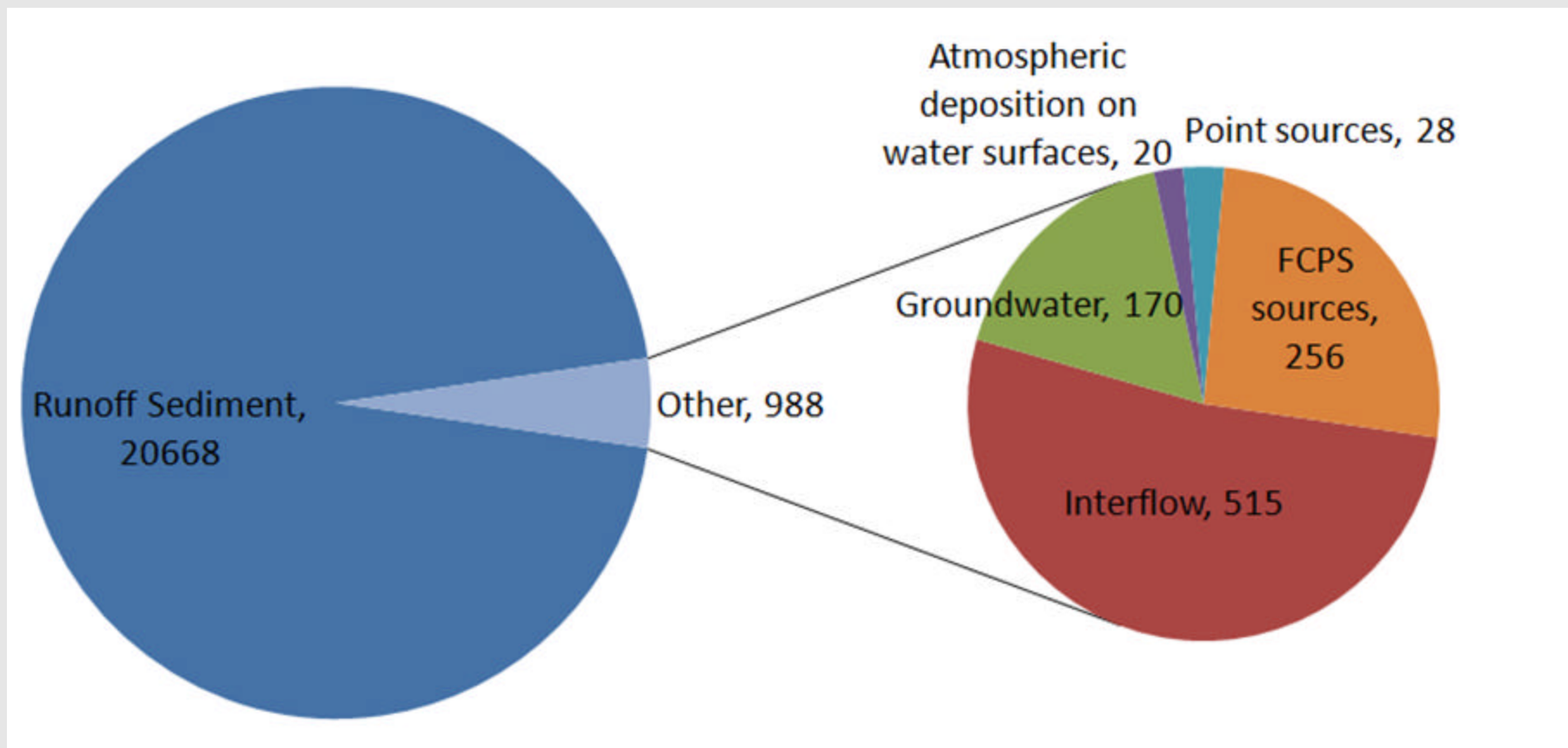


THg Calibration

River Mile 22.1



Existing Conditions (grams per year)



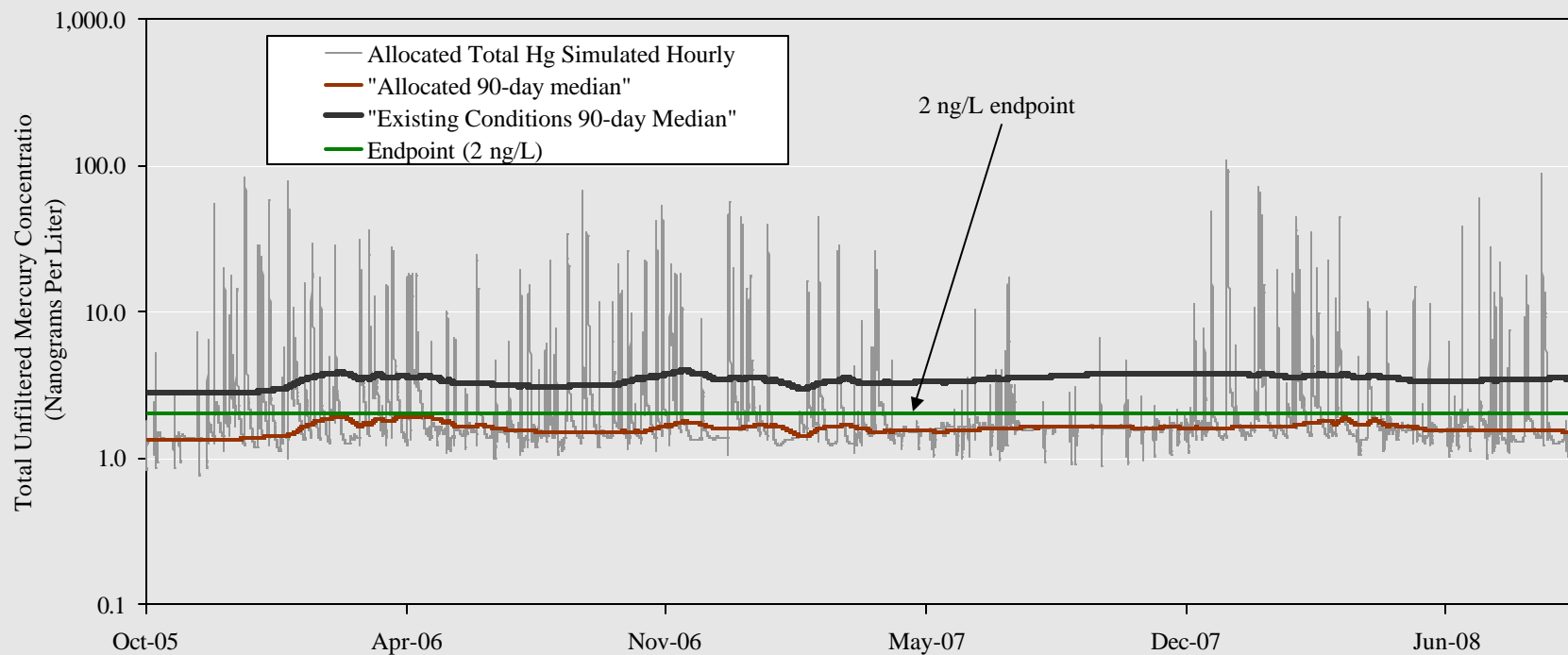
Allocation Results

- Reductions were applied to sources until the 90-day median was not exceeded
- Anticipated reduction to atmospheric deposition were inline with EPA expectations
- Similar reductions to interflow were applied as atmospheric deposition
- An overall reduction of 78% was recommended
- Margin of safety (MOS) was implicitly applied

Allocations Table

Source	Existing Load (grams per year)	Percent Reduction	Allocated Load (grams per year)
Hg in runoff sediment	20,666	80%	4,133
Hg in interflow	515	20%	412
Hg in groundwater	170	0%	170
Hg in atmospheric deposition	20	20%	16
Hg in point sources	28	52%	13
Hg in FCPS sources	256	52%	123
Total	21,655	78%	4,867

Simulated Concentrations Before and After Allocation



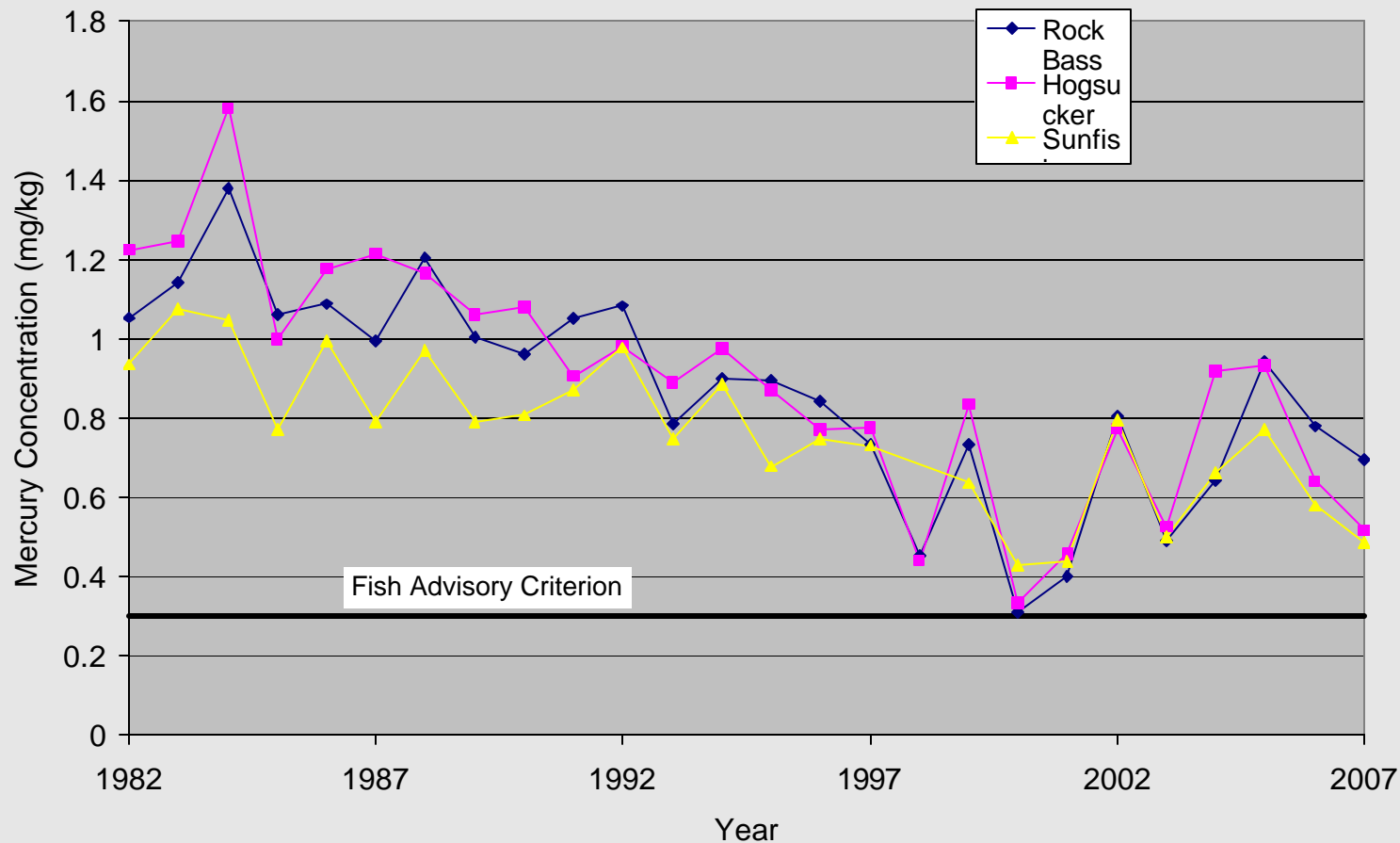
Annual TMDL

WLA (grams per year)	LA (grams per year)	MOS	TMDL (grams per year)
13	4,854	<i>Implicit</i>	4,867

Remedial Efforts

- Olin conducted several remedial efforts that have resulted in improved conditions including:
 - dredging contaminated sediments from the river
 - capping the disposal sites know as Pond 5 and Pond 6
 - Constructing a treatment plant to handle outflows from Ponds 5 and 6

Conditions Are Getting Better - fish tissue concentrations -



Thank you

- Special thanks to Arthur Butt and Shelley Williams from the Virginia Department of Environmental Quality
- Watershed stakeholders
- Technical Advisory Committee members
- All stakeholders especially those attending the meeting tonight



- Public Meeting 2 Public Review
- Submit to EPA
- State Approval
- Implementation Plan Development
- Implementation



North Fork Holston River Total Mercury TMDL Contacts

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Have a written comment?

Please send to:

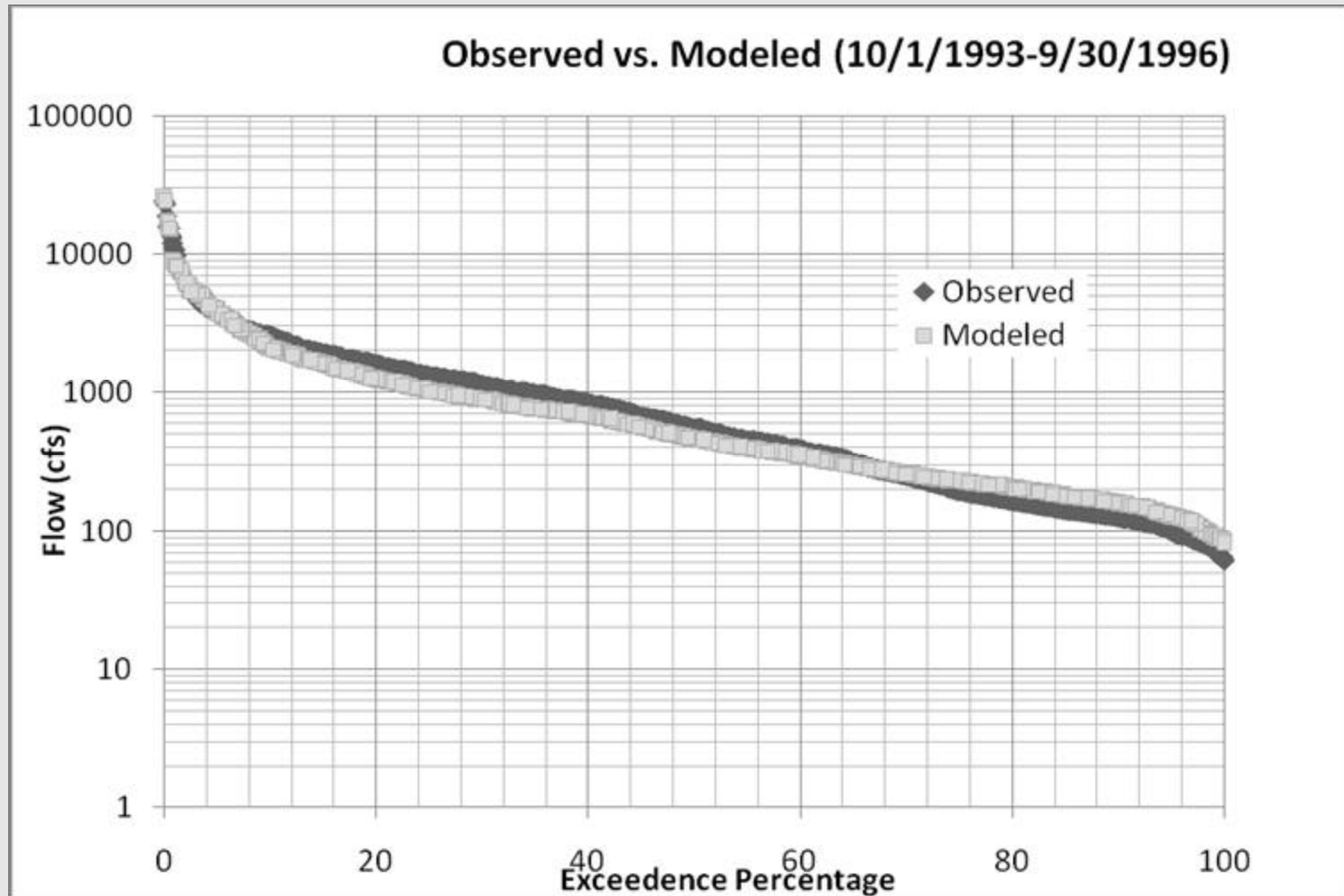
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Abingdon, VA 24212

Or via e-mail

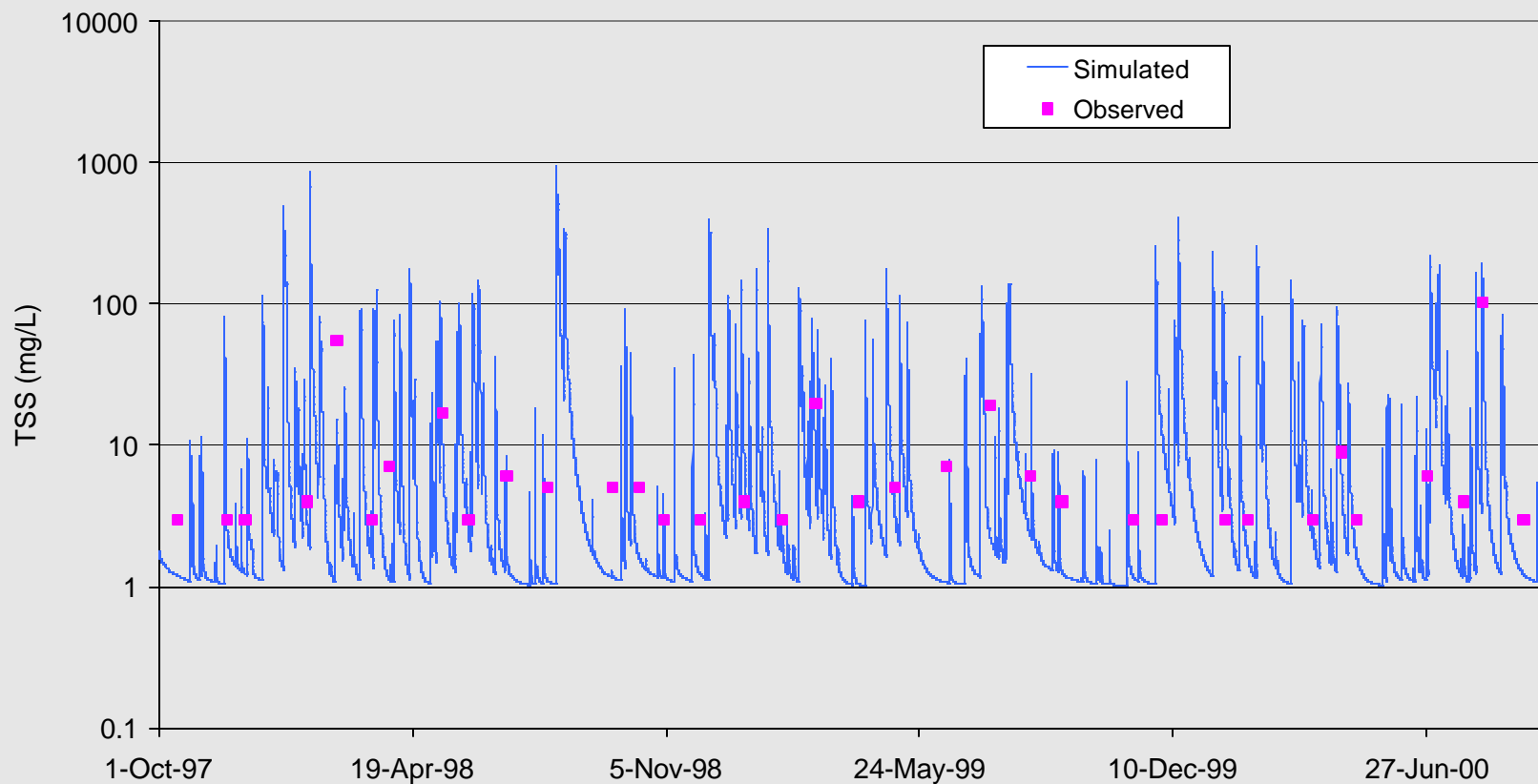
Comments must be postdated no later than March 1, 2010

Additional slides

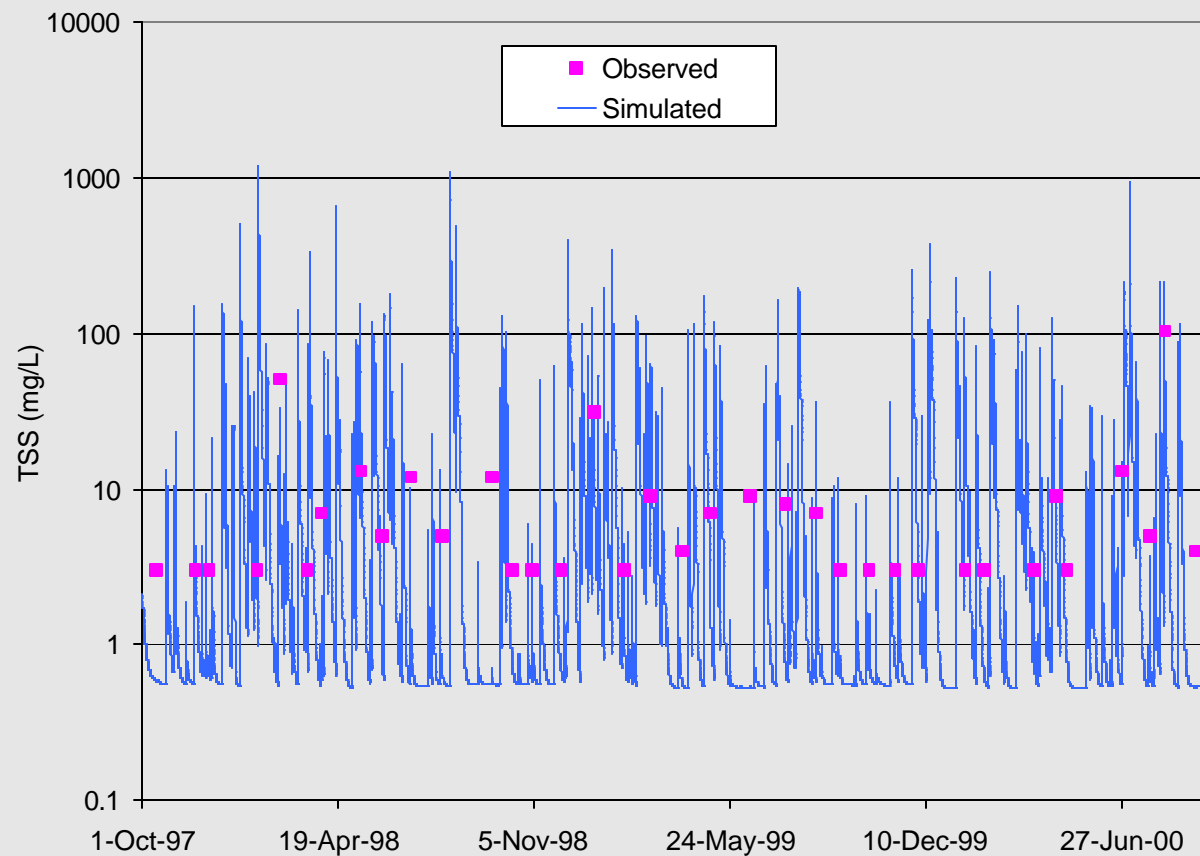
Hydrology Calibration



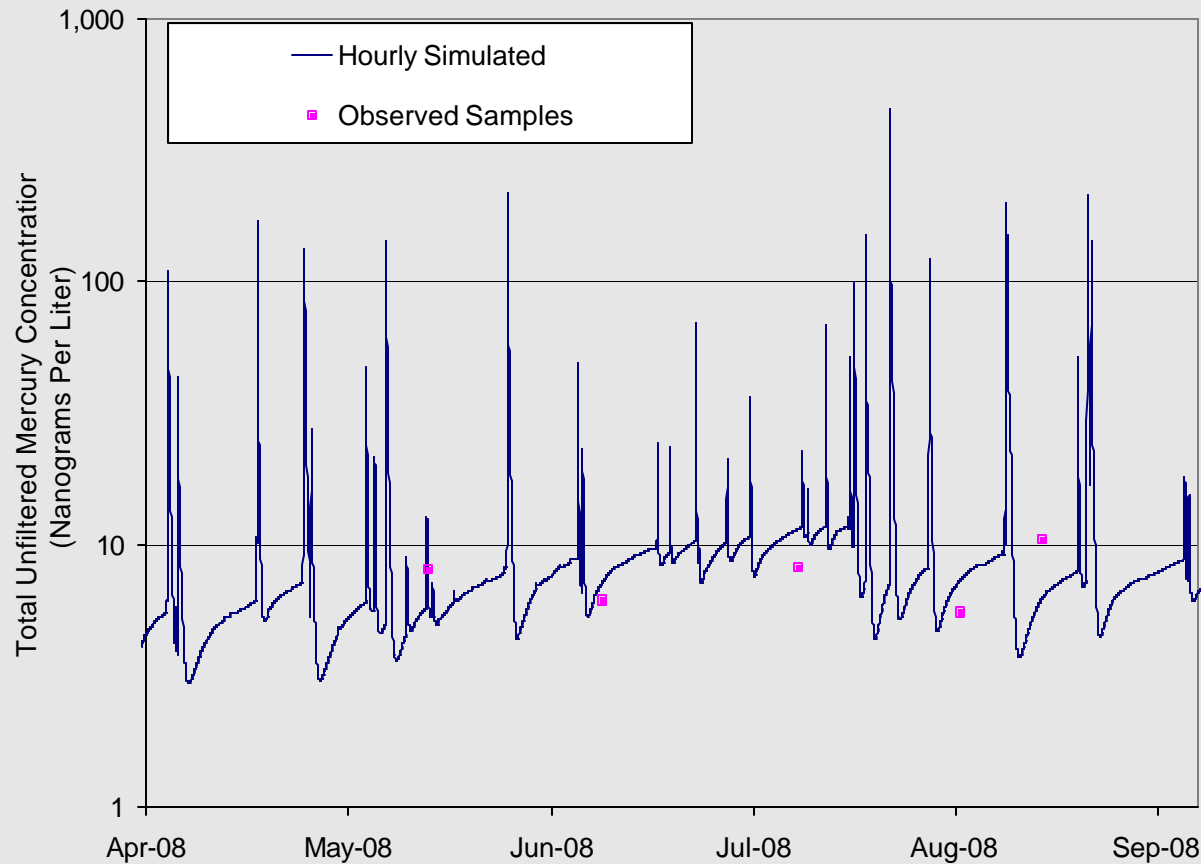
Sediment Calibration (6CNFH059.65)



Sediment Calibration (6CNFH089.25)

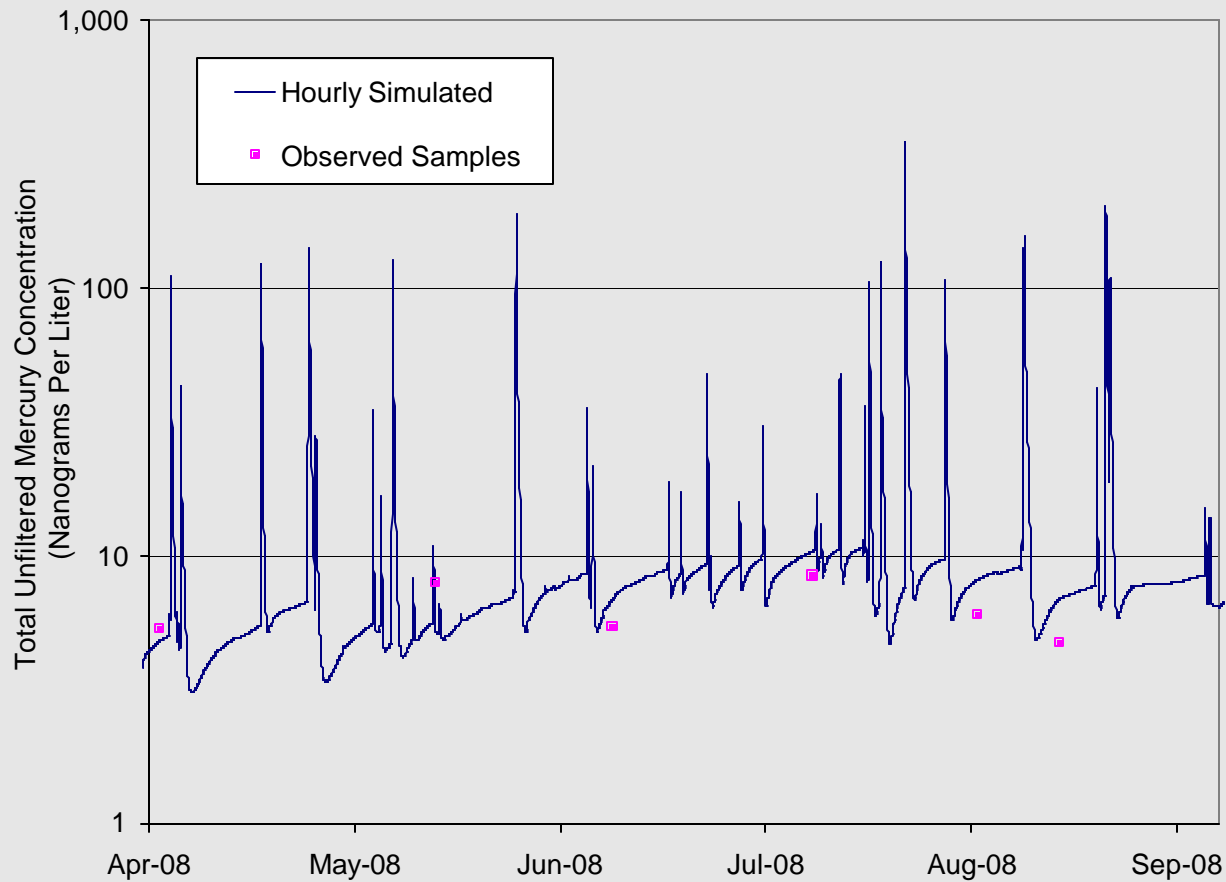


THg Calibration River Mile 76.9

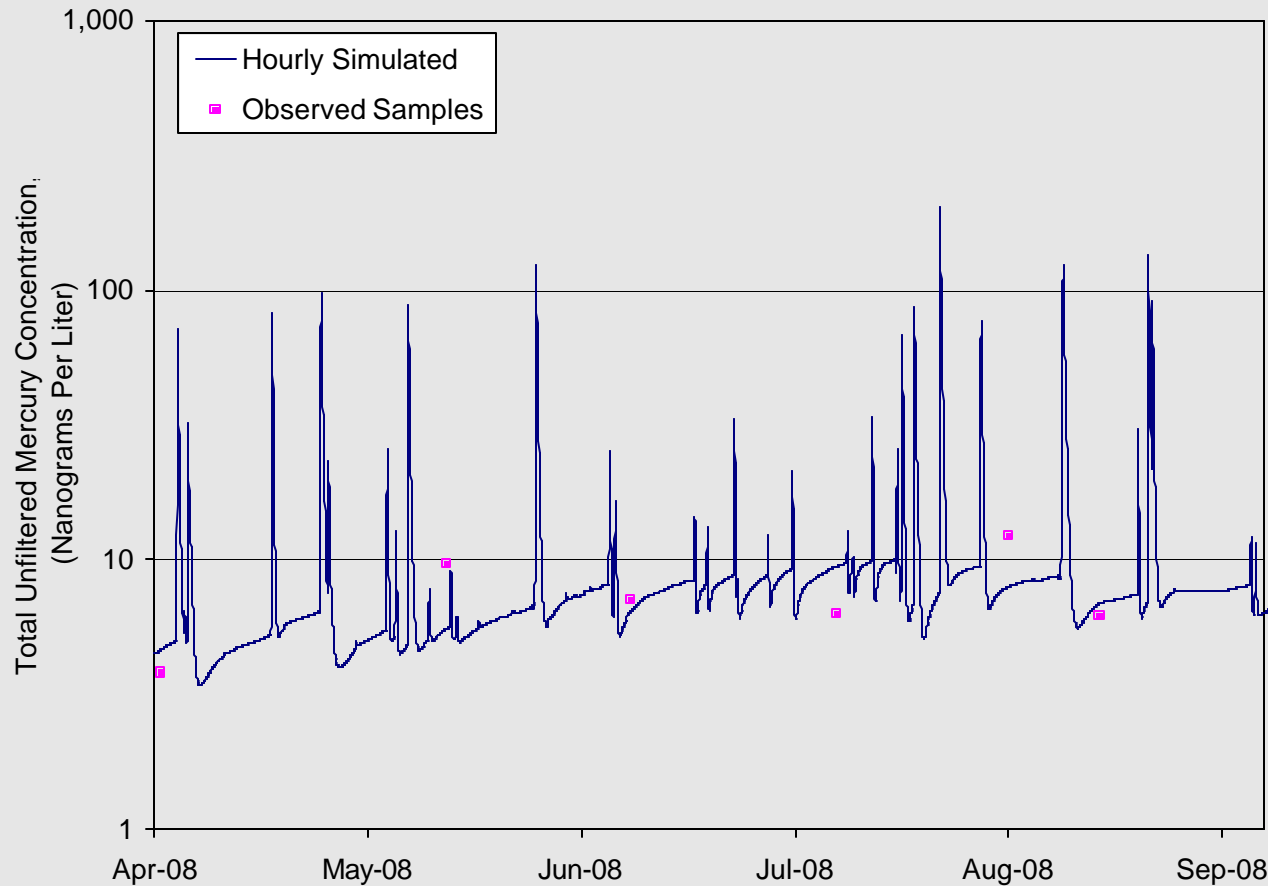


THg Calibration

River Mile 72.3

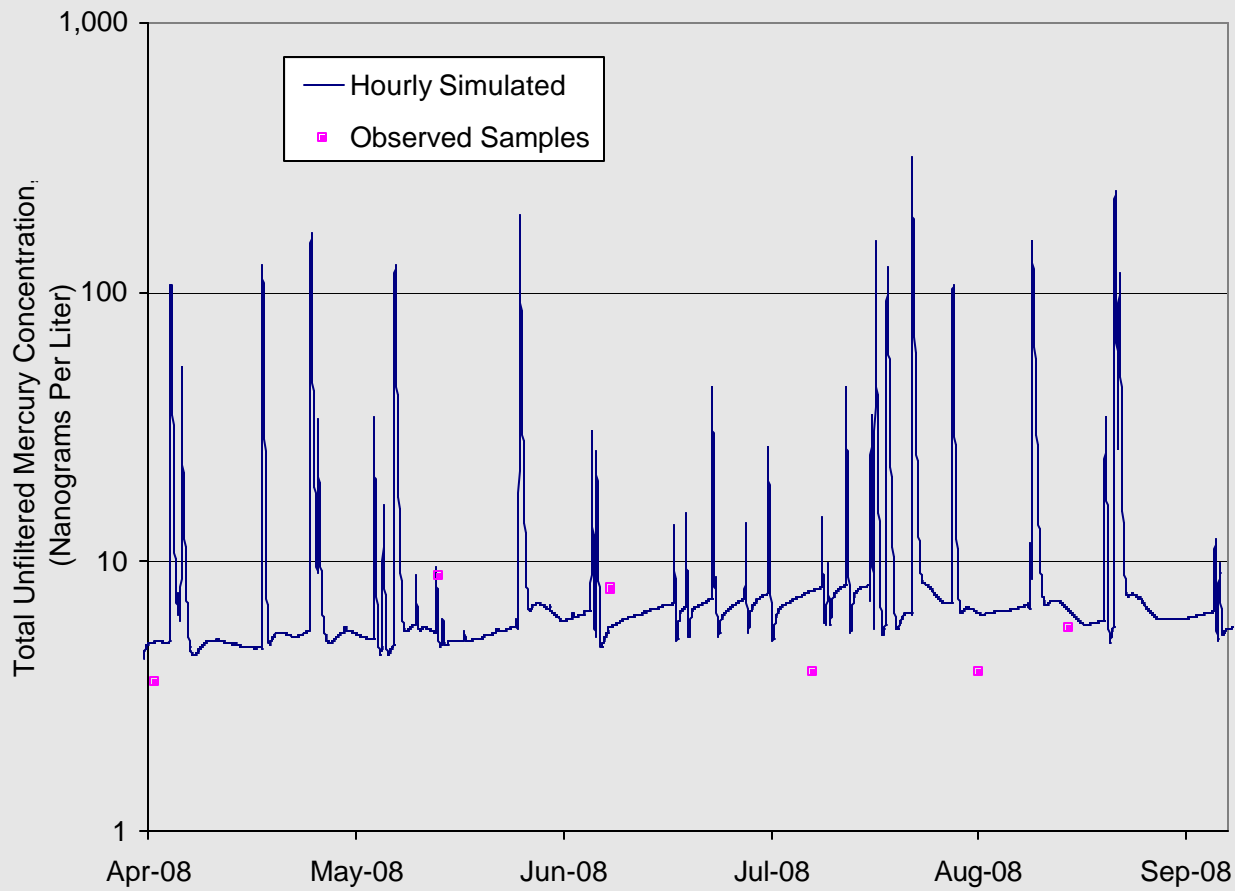


THg Calibration River Mile 69.9



THg Calibration

River Mile 60.7



THg Calibration

River Mile 8.8

